

*from:*Patent claims

1. A process for producing thin slabs with a predetermined convexity of their broad faces in a continuous casting installation, in which an immersion nozzle protrudes into a mold followed by a strand guiding means, said process having the following steps:

- a) The broad faces of the strand shell are planar in their surfaces in the region of an immersion nozzle shaped in the form of a spade, and are at the same time parallel with respect to their contour lines, and
- b) outside the shadow region of the immersion nozzle, said broad faces are shaped with planar surfaces and tapering conically toward the narrow faces;
- c) in the strand casting direction, the parts of the slab broad faces shaped with planar surfaces are fed conically to each other up to a longitudinal extent of the mold of from 40 to 60 % to such a degree that their lateral edges adapt themselves to the ends of the planar parts of the slab broad faces tapering conically with respect to the narrow faces, and

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- d) the wedge-shaped connecting pieces join up with the surface-like central parts of the slab broad faces with the respective planar-surface edge parts of the slab broad faces;
- e) subsequently, in the mouth region and after leaving the mold, the convexity formed by in each case three planar surface parts of the broad faces of the strand shell is kept constant in its form as far as the lowest point of the liquid crater of the slab.

2. The process as claimed in claim 1, wherein, for reducing the thickness of the slab in the region of the strand guiding framework, only the slab narrow faces are deformed.

3. The process as claimed in claim 1, wherein the wedge-shaped transitions between the planar slab central part, located in the shadow region of the immersion nozzle, and the slab broad-face parts tapering conically toward the narrow faces are given a form which encloses an angle  $\alpha < 5^\circ$  in the longitudinal extents of the slab central parts and represents a crowned surface which, having a point of inflection in the center, adjoins tangentially at its edges to the two neighboring surfaces.

4. A continuous casting installation for producing thin slabs, having a laterally adjustable mold into which an

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immersion nozzle protrudes, and in which there is opposite a larger crowned cross section on the charging side a cross section on the strand outlet side which is small and identically crowned in the central region, and having pairs of supporting and guiding rollers which follow the mold and have a caliber adapted to the emerging crowned strand, for carrying out the process as claimed in claim 1, wherein

- a) the immersion nozzle (11) has a spade-shaped mouth (13) with a maximum thickness (d) corresponding to  $d = 0.3 \text{ to } 0.5 \times D_E$ , where  $D_E$  is the distance between the mold broad faces (21) in the charging region,
- b) the broad-face parts (21) have at least in the shadow region of the immersion nozzle (11) central parts (23) which are arranged parallel to one another according to their contour lines,
- c) the broad-face plates (21) are designed at least in the adjusting region of the narrow-face plates (22) as planar side surfaces (24, 25),
- d) the planar side surfaces (24, 25) are arranged such that they move conically toward each other in the direction of the narrow faces

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(22),

- e) the planar-surface central plate (23) is connected to the planar-surface side surfaces (24, 25) by transitional parts (26, 27),
- f) the transitional parts (26, 27) taper toward each other in the form of a wedge and the wedge tip (28) ends at a distance (a), measured from the upper edge of the mold, with  $a = 0.5 \text{ to } 0.8 \times L$ , where  $L$  = the length of the mold, and
- g) the supporting and guiding rollers (41) have a contour which corresponds to the planar-surface central plate (23) and the planar side plates (24, 25) of the mold broad faces (21) in the region of the mouth of the mold.

5. The continuous casting installation as claimed in claim 4, wherein the central plates (23) are shaped as planar surfaces which move conically toward each other in the strand conveying direction at an angle  $\alpha$ , where  $\alpha = 5 \text{ to } 10^\circ$  with  $\alpha = 0.5 \text{ to } 0.8 \times L$ .

6. The continuous casting installation as claimed in claim 4, wherein the central plates (23) are shaped with planar surfaces in the shadow region of the immersion nozzle (11) up to  $a = 0.5 \text{ to } 0.8 \times L$  and are arranged such that they are disposed parallel to one another, and wherein there are

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provided connecting parts (29) which are parallel with respect to their contour lines and have in the strand conveying direction an S-shaped form, their ends respectively going over tangentially into the preceding and following part of the central plate (23) and their transitional parts (26, 27) being adapted to the connecting part (29) in their longitudinal extent up to the wedge tip (28).

7. The continuous casting installation as claimed in claim 4, wherein the transitional parts (26, 27) are shaped as a crowned surface, the crowned surface tangentially adjoining at one end the respective slab side plate (24, 25) and at the other end the slab central plate (23) and having a point of inflection in the center.

8. The continuous casting installation as claimed in claim 4, wherein the supporting and guiding rollers (41) are designed as split rollers (42-44), the respective bearings (47) being provided in the region of the planar-surface central plate (23).

9. The continuous casting installation as claimed in claim 4, wherein there are provided in the guiding framework, in a way corresponding to the shaping of the slab, rollers which are designed cylindrically in the central region and conically in the side regions, with a diameter which enlarges outwardly.

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10. The continuous casting installation as claimed in claims 4 or 7, wherein the transitional pieces (26, 27) are connected to a separate cooling means.

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## List of items

### Feeding

- 11            ~~Immersion~~ nozzle
- 12            Tubular part
- 13            Spade-shaped mouth
- 14            Rectangular part

### Mold means

- 21            Mold broad faces
- 22            Mold narrow faces
- 23            Central surface
- 24            First side surface
- 25            Second side surface
- 26            First transitional part
- 27            Second transitional part
- 28            Wedge tip
- 29            Connecting part

### Adjusting means

- 31            Adjusting element

### Guiding means

- 41            Supporting and guiding rollers
- ~~42            Convex roller~~

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